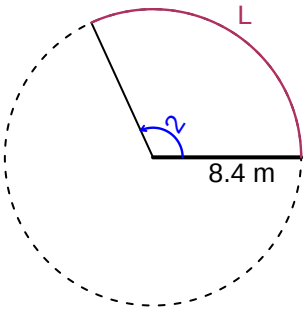
Name: Date:

Trig Final (Solution v20)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2 radians. The radius is 8.4 meters. How long is the arc in meters?

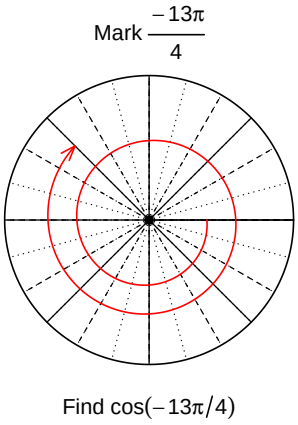


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

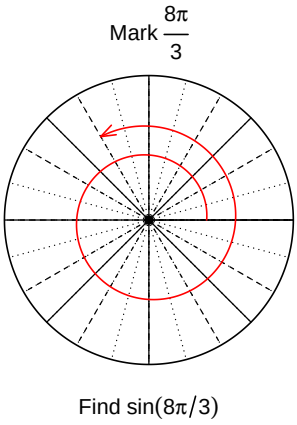
$L = 16.8$ meters.

Question 2

Consider angles $\frac{-13\pi}{4}$ and $\frac{8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-13\pi}{4}\right)$ and $\sin\left(\frac{8\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\cos(-13\pi/4)$



Find $\sin(8\pi/3)$

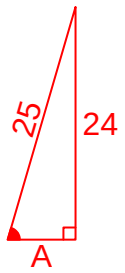
$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(8\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\sin(\theta) = \frac{24}{25}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

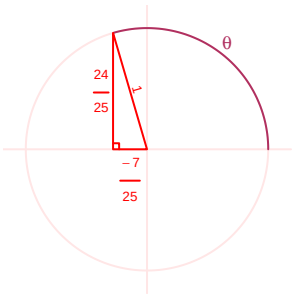
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 24^2 = 25^2$$
$$A = \sqrt{25^2 - 24^2}$$
$$A = 7$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-7}{25}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.65 Hz, an amplitude of 8.17 meters, and a midline at $y = -3.33$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.17\sin(2\pi 6.65t) - 3.33$$

or

$$y = -8.17\sin(13.3\pi t) - 3.33$$

or

$$y = -8.17\sin(41.78t) - 3.33$$